Sulfur L Absorption Spectra Observed by Total Electron Yield Method

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INTRODUCTION

The valence band x-ray emission and absorption spectra are very useful technique for the studies of valence band structure. The absorption spectra give the information about the unoccupied orbital of valence band structure. K and L x-ray absorption spectra for molecules such as SO_4^{2-},[1)] SF_6[1), 2)] and SiF_4,[3)] where electronegative ligand atoms surround a central atom, show resonance-like bands below and above the ionization threshold and quite weak Rydberg series.The resonance in x-ray absorption spectra has been interpreted through the concept of the effective potential barrier created by surrounding atoms. In this work, S-L x-ray absorption spectra of sulfate compounds have been measured by total electron yield method(T.E.Y.).

EXPERIMENTAL RESULTS

The absorption spectra were measured by used ALS beamline 6.3.2. This beamline is bend magnet beamline and energy range is 50eV-1000eV. Absorption spectra were obtained by collecting total electrons from the sample which has been embedded in indium metal.

S-L absorption spectra of Na_2SO_4, Na_2SO_3, $Na_2S_2O_3$ and $Na_2S_2O_5$ are shown in Fig. 1. As total structure, there is a big absorption peak at about 174eV. This peak is L absorption. The other L absorption peak is at about 182eV. For L absorption peak in high energy side, Na_2SO_4, Na_2SO_3, $Na_2S_2O_3$ and $Na_2S_2O_5$ is the same energy position. S-L absorption spectrum of Na_2SO_4 compare with the other three compounds, it is simple. SO_4^{2-} ion is T_d point group. Therefore, the absorption spectrum of Na_2SO_4 is very simple. The absorption spectrum of Na_2SO_3 is not complexity so well, too. SO_3^{2-} ion is C_{3V} structure. As total structure, the absorption peak is from about 170eV to about 175eV. The S-L absorption spectrum of Na_2SO_3 is complexity a little. $S_2O_3^{2-}$ ion is a molecule which combined SO_3^{2-} ion with another sulfur. One sulfur is electronegative of 2-, another sulfur is electropositive of 6+. The electronegative atom's electron is not influenced by surrounding atoms, but the electropositive atom's electron is influenced by surrounding atoms. Therefore this spectrum is complexity a little. The S-L absorption spectrum of $Na_2S_2O_5$ is shown in Fig. 1. This spectrum is simple, too. The S-L absorption spectra of ZnS, K_2S and NiS is shown in Fig. 2. The absorption spectra of these sulfide is not complexity so well. Because these compound's electron is not influenced so well by metal ion. It is necessary to discuss to analysis of these all spectra.

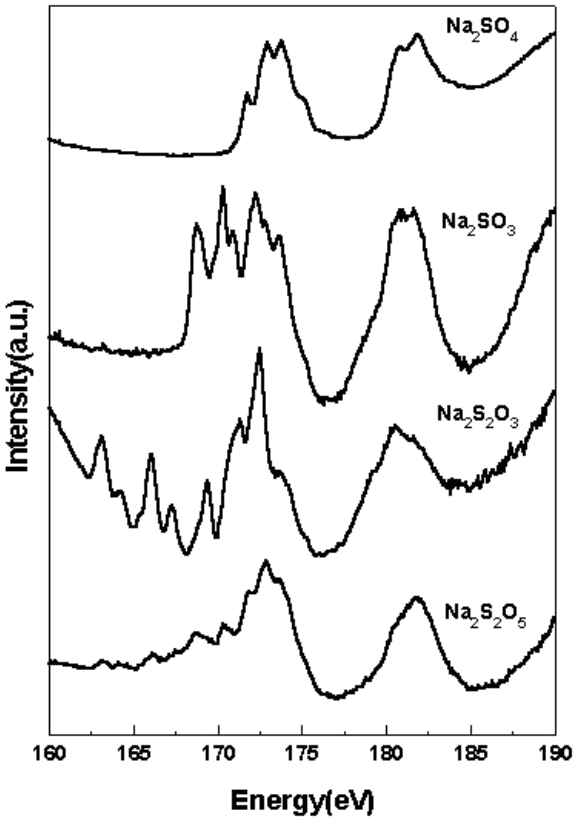

Figure 1. S-L absorption spectra for Na_2SO_4, Na_2SO_3, $Na_2S_2O_3$, and $Na_2S_2O_5$ measured by T.E.Y.

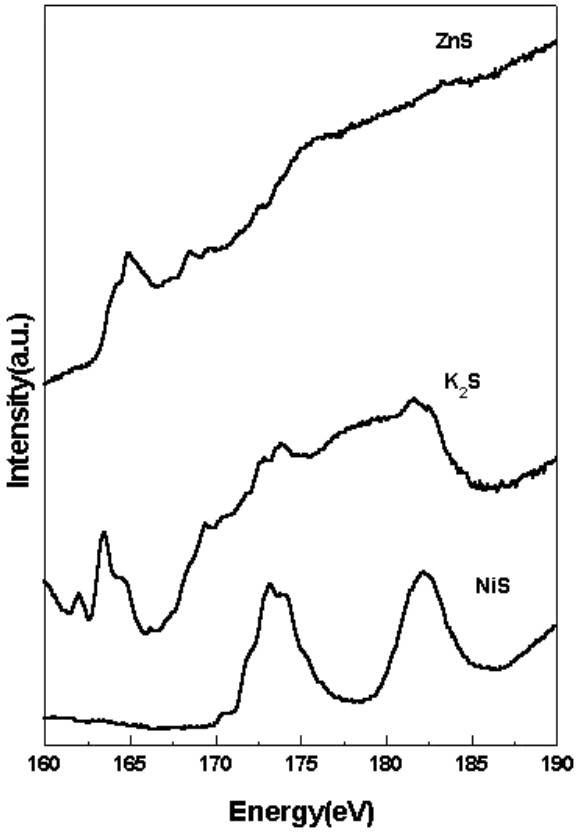

Figure 2. S-L absorption spectra for ZnS, K_2S and NiS measured by T.E.Y.

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